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Planning Officer	*David J. Mackett*
Data Systems Manager	*Vacant*
Executive Officer	*Benjamin F. Remington*

LABORATORIES & DIVISIONS

Coastal Fisheries Resources Division, Chief La Jolla, California	*Reuben Lasker*
Honolulu Laboratory, Director Honolulu, Hawaii	*Richard S. Shomura*
Oceanic Fisheries Resources Division, Chief La Jolla, California	*Gary T. Sakagawa*
Pacific Environmental Group, Chief Monterey, California	*Andrew Bakun*
Tiburon Laboratory, Director Tiburon, California	*Norman J. Abramson*

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HONOLULU LABORATORY
Honolulu, Hawaii

INSULAR RESOURCES INVESTIGATION

Bottom Fish-Seamount Fishery Management Plan Set for Final Approval

Members of the Western Pacific Regional Fishery Management Council (Council) have been working for several years to develop a Fishery Management Plan (FMP) for the bottom fish and seamount groundfish fisheries of the western Pacific region. The Council recently completed the FMP and it has been sent to Washington, D. C. for final review and comment. Progress in developing the FMP to this point is primarily the result of efforts by the Council's Bottom Fish Planning Team, which is composed largely of staff members at the Honolulu Laboratory, including Dr. Stephen Ralston, Leader of the Insular Stock Assessment Program, Samuel G. Pooley, Industry Economist, and Dr. George W. Boehlert, Chief, Insular Resources Investigation.

Although these two fisheries are being treated together under the same FMP, they are in fact quite different. The bottom fish fishery is based on domestic handline fishing for deepwater species, including the snappers (Lutjanidae), groupers (Serranidae), and jacks (Carangidae). These are typically found in rough, untrawlable habitats in the 80-250 m depth zone. Active and productive fisheries for these high-priced species presently exist in Hawaii, American Samoa, and Guam. In contrast, the seamount fishery for pelagic armorhead, Pseudopentaceros wheeleri, has declined abruptly from the early 1970's. In 1973 the Japanese trawled in excess of 8,000 metric tons (MT) of this species from the U. S. Fishery Conservation Zone (FCZ) at Hancock Seamount. The Russian catch is thought to have exceeded this. Now the resource is severely depleted, and a 6-year moratorium on the commercial harvest of armorhead at Hancock Seamount has been implemented.

The FMP that has been proposed by the Council is structured as an outline. With the passage of the FMP, an administrative mechanism will trigger the implementation of regulatory measures relatively quickly. A list or menu of these has been included in the FMP for possible implementation in the future should the Council deem it necessary. Several of the regulations considered include quotas, size limits, area and seasonal closures, effort limitations, gear restrictions, and access limitation. If the FMP is approved, the only regulations to go into effect immediately will be: (1) a prohibition on harvesting bottom fish species with explosives, poisons, trawls or gill nets in the FCZ, (2) a Northwestern Hawaiian Islands (NWHI) bottom fish permitting system to keep track of fishing activity in this region, and (3) provision for an annual review of the stocks and recommendations for management action if necessary. The Council is, however, actively considering an access limitation program for the NWHI bottom fish fishery. It appears likely

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that such a decision would be the first framework regulation implemented under the new FMP.

The plan is expected to be approved and to go into effect in September. If implemented, the Honolulu Laboratory staff will continue to play a major role in assuring the success of the FMP by monitoring biological and economic conditions in these fisheries and providing the Council with up-to-date assessment information. (S. Ralston (808) 943-1221)

Estimates Updated for Spiny Lobster Maximum Sustainable Yields

Dr. Jeffrey J. Polovina, Leader, Artificial Reef Program, continues research on formulating more accurate estimates of maximum sustainable yields (MSY) for the spiny lobster resource in the NWHI. Based on research cruises in 1977 and the annual lobster assessment cruise of 1985, plus reported commercial landings for 1985, estimates of maximum sustainable yields for spiny lobsters at Necker Island and Maro Reef were computed using a surplus production model (Table 1).

Table 1. Estimated maximum sustainable yields (numbers) and optimum fishing effort for spiny lobsters in the Northwestern Hawaiian Islands, 1985.

Area	CPUE ≥7.7 cm		1985 Commercial landings		MSY	Optimum
	1977	1985	No.	Effort	no.	effort*
Necker I.	3.03	0.79	185,654	235,005	242,000	159,000
Maro Reef	3.43	1.75	359,949	205,685	360,000	210,000
Other areas	NA	NA	410,439	NA	294,000	NA

NA = Not available.
*Effort is measured as a 1977 standardized trap-night.

The MSY estimate for the "other areas" category was determined by adjusting it for differences in fishing ground habitat and catch rates.

The best estimate of MSY for the NWHI spiny lobster resource presently is 896,000 lobsters. The 1985 estimated landings of 956,000 lobsters exceeded the MSY figure by 6.7% (60,000 lobsters).

These results suggest that the spiny lobster resource at Necker Island is currently overfished because the 1985 standardized effort is greater than the optimum effort, and the 1985 catch from this area is less than the computed MSY. Maro Reef appears to be exploited at optimum effort and MSY. For the "other areas" estimate, the estimated MSY of 294,000 lobsters may be an underestimate since the research effort at St. Rogatian Bank was limited and the low catch rates experienced in this area appeared to be at

variance with subsequent commercial catch rates. (J. J. Polovina (808) 943-1221)

Effects of Suspended Solids on Pelagic Fish Larvae Evaluated

Dr. Paul L. Jokiel, Fishery Biologist, Research Assistant Russell Y. Ito and Thomas K. Kazama, Fishery Biologist, have completed a series of experiments at the Kewalo Research Facility that was designed to evaluate the effects of various types of sediments on the eggs and larvae of the dolphin Coryphaena hippurus, which is an economically important food fish known locally as the mahimahi.

Increased activity in ocean mining, ocean dumping, and large-scale coastal construction has raised concerns about the effects of suspended solids on Hawaiian fisheries. Several reports (including results of an interagency planning workshop on fisheries habitat conservation held at the Honolulu Laboratory on June 27-28, 1985) identified a need for information on the effects of sediments on larval pelagic fishes. A wide range of sediment types was tested, including manganese crust tailings, pelagic red clay, pelagic carbonate clay, Barber's Point Deep Draft Harbor dredge spoils, Pearl Harbor dredge spoils, kaolin clay, and bentonite clay. The highest concentrations of such sediment that have been measured in actual ocean dumping and mining operations in Hawaii is on the order of a few milligrams/liter, plus highly localized concentrations of up to a few tens of milligrams/liter near the point of discharge. Such loading levels appear to be harmless to the eggs of mahimahi. Under normal conditions of slight turbulence, the eggs tolerated concentrations of fine kaolin clay as great as 8,000 mg/liter over a 4-day development time without apparent harm. Likewise, larvae are quite tolerant. Prolonged exposure (from 2 to 24 hours) to extremely heavy loadings (such as thousands of milligrams/liter) of sediment does not appear to harm the larvae directly, although prolonged exposure results in a lower feeding rate (probably the sediment impairs visual feeding) that can eventually lead to starvation. Nonetheless, to produce a measurable effect would require levels that are several orders of magnitude greater than what is normally discharged in a plume. (P. Jokiel (808) 943-1221)

PELAGIC RESOURCES INVESTIGATION

Two Mahimahi Successfully Tracked

As part of a program to investigate the effects of fish aggregating devices (FAD's) on pelagic species, two mahimahi, Coryphaena hippurus, tagged with ultrasonic depth sensitive transmitters, have been successfully tracked. Mahimahi, like small yellowfin tuna, Thunnus albacares, and skipjack tuna, Katsuwonus pelamis, are often associated with FAD's. The tracking projects are a joint effort of the staff of the Tuna Behavior and Physiology Program and Dr. Kim Holland of the Hawaii Institute of Marine Biology, University of Hawaii (UH).

The first mahimahi was caught at 0800 on March 5 on the RV Kaahele'ale. It was caught in the area off windward Oahu, Hawaii adjacent to FAD "W." The dolphin remained around the FAD briefly and then moved slowly inshore, spending the entire night near the 183-m (100-fathom) ledge. The following morning, it proceeded directly to FAD "LL" located several miles from FAD "W" where it was first caught. The second mahimahi was also captured near FAD "W." Unfortunately, this fish died after only several hours of tracking.

These are the first two mahimahi ever tracked. Like tuna, mahimahi appear to have good navigational abilities and appear to know the location of FAD's. Unlike tuna, however, the first mahimahi moved inshore at night (all yellowfin tuna tracked near Oahu moved offshore at night) and swam at deeper depths during the night than during the day (yellowfin tuna exhibited the opposite depth behavior). (R. W. Brill (808) 943-1221)

Data Analysis of Two Experiments Completed

Peter G. Bushnell, Fishery Biologist, has completed analysis of the data from the experiments on the cardiorespiratory reactions of skipjack and yellowfin tunas exposed to brief periods of low ambient oxygen. The research is part of a larger series of experiments designed to elucidate the effects of environment on tuna movements, distribution, gear vulnerability, and natural mortality.

The data clearly show that skipjack and yellowfin tunas are more sensitive to reduced ambient oxygen than other fish species studied (e.g., trout, lingcod). The data from the experiments were compared with the data from the yellowfin tuna tracking project, during which swimming depth distribution and the ambient oxygen levels (pO_2 of 120-130 mm Hg) at which yellowfin tuna first begin to show cardiorespiratory reactions were measured. The levels at which tuna show cardiorespiratory reactions are the lowest oxygen levels at which yellowfin tuna normally occur in the ocean around Hawaii. Whether this oxygen level, which is far above the lethal low oxygen level, is the limiting factor in the depth distribution of yellowfin tuna is still unclear. (R. W. Brill (808) 943-1221)

Analysis of Effects of Parasite on Yellowfin Tuna Completed

Research Assistant Robert E. Bourke has completed analysis of the data collected to test for the effects of the intravascular larval cestode (tapeworm) parasite on the growth, mortality and physiology of yellowfin tuna. The data show no differences in length/body weight, heart weight/body weight, otolith weight/body weight (a measure of age at a given body size), or RNA/DNA (a measure of immediate growth rate history) ratios between infested and uninfested fish. However, direct (in vitro) measurement of the pressure/flow relationships in the isolated perfused dorsal aorta of infested and uninfested fish shows that the parasite and attendant immune reaction of the host causes severe occlusion of this vessel. How yellowfin tuna are apparently able to be unaffected by occlusion of this major blood vessel remains a mystery. (R. W. Brill (808) 943-1221)

DATA MANAGEMENT AND TECHNICAL SERVICES

Bernoulli Boxes Acquired

Fletcher V. Riggs, Chief, Data Management and Technical Services, reports that the Honolulu Laboratory has acquired three Bernoulli boxes to be used in conjunction with the IBM PC/AT's. The Bernoulli box is a unique mass storage device which combines the advantages of hard disk and floppy disk drives. As with standard hard disk drives, the Bernoulli box is capable of storing large amounts of data (Bernoulli cartridges are 10 or 20 megabytes in size), and access speed is only slightly slower than that of most hard disks. Like floppy disks, Bernoulli cartridges are removable and portable (weighing less than a pound), making them a good choice for transporting large quantities of data between systems.

The Honolulu Laboratory plans to use a Bernoulli box with the shipboard computer system on the NOAA Ship Townsend Cromwell where conditions are less than ideal for standard hard disk systems. The design of the Bernoulli box makes it less susceptible to the jarring conditions at sea. Staff of the Honolulu Laboratory also plan to use the Bernoulli boxes on shore as portable, shared-disk backup systems for its IBM PC/AT's. (J. Pappas (808) 943-1221)

Honolulu Laboratory Personnel Attend Cray Supercomputer Workshop

Five staff members at the Honolulu Laboratory recently attended a workshop at the UH introducing them to the Cray X-MP supercomputer at the University of California at San Diego. Topics included an introduction to the Cray Time Sharing System and associated routines; information sources and editing procedures; compiling, loading, and running FORTRAN programs; and other system features including the debugging tool, external libraries such as IMSL and DISSPLA, and other available software packages. Through existing communications circuitry, any terminal in the Honolulu Laboratory is capable of connecting to the Cray.

Communication between the Hawaii Remote User Access Center and the Network Control Processor is at 56K baud. This relatively high communications speed at little direct communication cost (at present there is no cost) can possibly be used for data transfer and communication between the Honolulu and La Jolla Laboratories, although this possibility has not been tested. (J. Pappas (808) 943-1221)

COASTAL FISHERIES RESOURCES DIVISION
La Jolla, California

Visiting Japanese Scientist Continues Work at SWFC

Dr. Yoshiro Watanabe from Tohoku Regional Fisheries Research Laboratory, Japan, has been at the Southwest Fisheries Center (SWFC) since the end of September. He is currently involved in three ongoing studies: starvation mortality of inshore and offshore anchovy larvae, working with Fishery Biologist Gail H. Theilacker, larval production and mortality of saury, with Statistician Dr. Nancy C.H. Lo, and comparison of growth between saury from the northeast and northwest Pacific with Fishery Biologist John L. Butler. Dr. Watanabe intends to work on the morphology of larval and juvenile saury in the second half of his stay.

One of Dr. Watanabe's goals has been to introduce into Japan research methods of pelagic fishes which have recently been devised and developed at the SWFC. He has submitted three short papers to a Japanese newsletter and journal explaining background and methods of the sardine and anchovy recruitment project (SARP), histological estimation of larval mortality from starvation, and immunoassay of egg and larval predation. Watanabe has participated in research cruises on the NOAA Ship Townsend Cromwell and the David Starr Jordan and has attended training sessions organized for SARP. He is currently studying the SWFC egg production method for anchovy biomass analysis.

He will present two papers to the Tenth Annual Larval Fish Conference in Miami in mid-May : "Intracellular protein digestion in fish larvae," and "Larval production and mortality of saury, Cololabis saira, in the northwest Pacific."

COASTAL EASTERN PACIFIC POPULATION BIOLOGY OF FISHES

Spawning Frequency of Scomber japonicus Estimated

Beverly Macewicz, Biological Technician, and Terri Dickerson, Fishery Biologist at the California Department of Fish and Game, completed histological analysis of the ovaries of Pacific mackerel (Scomber japonicus) from a series of opportunistic collections taken during the peak months of spawning in 1985 (April 2-July 11). Over this 101-day period, 330 female mackerel were collected and their ovaries classified histologically according to the system developed by Hunter and Macewicz. Rates of absorption of postovulatory follicles were verified using the ovaries of female mackerel spawned in the laboratory by Fishery Biologist Roger Leong.

The best estimates of the frequency of spawning were provided by the incidence of females with ovaries in the migratory nucleus stage (a

precursor to hydration) and those with postovulatory follicles 10-34 hours old. Over the 101 days, 8.1% of the mature females had ovaries in the migratory nucleus stage and 9.2% in the postovulatory follicle stage. These data indicate that the average female in the population spawned 8.7 times during the 101 days.

These results indicate that total fecundity for species of Scomber may have been underestimated in the past. Total fecundity (all oocytes to be spawned in a season) is usually considered to include all oocyte maturity states at and beyond the yolk vesicle stage. Typically in a mature ovary there exists about 4-5 potential spawning batches over this range of oocyte maturity stages, and this implies 4-5 spawnings. The estimates of spawning frequency indicate that at least 8.7 batches are spawned, and thus estimates of total fecundity based on standing stocks of oocytes may underestimate the actual seasonal fecundity by as much as a factor of two.

Although the average female may spawn 8.7 times in 101 days, it is clear that individual females did not spawn at regular intervals over this period. Rather, spawnings probably occurred in rapid succession after which the ovary was resorbed. This is indicated by: 1) the high frequency (62%) of females with highly atretic or postspawning ovaries throughout the season; 2) the high incidence in females with active nonatretic ovaries of histological stages that indicated recent or imminent spawning (55%); and 3) the presence in the same advanced ovary of more than one histological stage indicative of recent or imminent spawning.

About 32% of active ovaries (ovaries with little or no atresia) contained more than one stage of imminent or recent spawning (hydrated oocytes, oocytes with migratory nucleus, postovulatory follicles of age 10-35 hours and those aged older than 35 hours). As the duration of each stage was 24 hours or less, the occurrence in the same ovary of more than one stage makes it possible to estimate the interval between 2 spawnings in each of these females. The average interval was 1.3 days, indicating that a significant fraction of the females was spawning at nearly daily rates. If the average female spawned every 1.3 days, it would require 11.4 days to produce the 8.7 batches that Macewicz and Dickerson estimated occurred over the 101 days. The actual duration of the spawning period for the average female is probably longer than 11.4 days, because if this were the case, the ratio of females with single spawning stages to those with multiple spawning stages would be expected to be only 0.3 day, whereas the observed ratio was 0.78. However, an 18 day spawning period (average 2 days between spawnings) would account for the incidence of females with single spawning stages in the ovary.

At the present time, we do not know how well all ages were represented in our collections. As older mackerel probably spawn for much longer periods than younger ones, oversampling younger animals could lead to a substantial underestimate of the number of spawning batches produced by the average female. Further, their estimate of 8.7 spawnings for the population is undoubtedly an underestimate of the yearly production of spawn because they sampled only during the peak spawning months. (J. Hunter, FTS 893-6220)

Predation of Euphausia pacifica on Eggs and Yolk-Sac Larvae of Northern Anchovy Studied

As part of a study to determine the causes of mortality of anchovy larvae, Gail Theilacker, Fishery Biologist, and Marlene Johnson, NOAA Junior Fellow, used a recently developed immunoassay technique to detect the remains (yolk protein, which cannot be visually identified) of northern anchovy (Engraulis mordax) eggs and early larvae in the stomachs of euphausiids (Euphausia pacifica) collected at two contrasting sites off California. In the present application, the technique is used to detect presence or absence of yolk in the predator's stomachs.

Euphausiids co-occur in the sea with northern anchovy eggs and larvae and, from evidence Theilacker obtained previously in laboratory predation studies, they could be responsible for an important portion of the egg and larval mortality. In the laboratory, adult euphausiids consume up to 25 anchovy larvae a day.

Field collections of anchovy eggs and early larvae and euphausiids were taken inshore where anchovy spawning was intense and offshore where anchovy spawning was minimal. Abundances of anchovy eggs, yolk-sac larvae, and adult and juvenile euphausiids were estimated as numbers of individuals under 10 m*m sea surface (see Table).

Estimated abundance/10 m*m		Predation by euphausiids		
Anchovy yolk-sac (eggs/larvae)	Euphausiids (juv./adults)	Immuno assay (fraction+)	Est. feeding rate/d (indiv/pop.)	Anchovy eaten/d (%)
Inshore				
18207/3200	526/192	43/55	3.8/1156	5
18207/3200	927/542	47/59	4.0/2854	13
Offshore				
1942/240	399/3376	5/65	0.2/608	28

To calculate the impact of euphausiid predation at the two contrasting sites, Fishery Biologist Alec MacCall suggested that Theilacker assume that the number of eggs and larvae in a euphausiid stomach is described by a Poisson distribution. Because the immunoassay technique does not provide information on how many eggs and larvae were consumed, counts of one or more are combined. Fortunately, the mean of the Poisson distribution can be estimated directly from the frequency of "0" counts (negative assays). With some additional field and laboratory information, Theilacker estimated the total number of eggs and larvae the euphausiid population consumed per day.

The egg and larval (yolk-sac) daily mortality rates (Z) due to euphausiid predation at the inshore site were 0.05 and 0.13/day, with an average of 0.09. At the offshore site, Z was 0.28/day. The total instantaneous mortality rate calculated from the above egg and larvae data for the inshore site was 0.6/day and for the offshore site was 0.7/day. Thus the results from this preliminary study show that the difference in mortality between the inshore and offshore sites can be accounted for by differences in rates of euphausiid predation.

Theilacker will present this information at the Ecosystems Symposium American Fisheries Society Larval Fish Conference in Miami in May. (G. Theilacker, FTS 893-6331)

Research Survey Findings Indicate Prospects Favorable for Establishing a U.S. Albacore Fishery in the South Pacific

Based on the results of trolling exploration conducted by two U.S. fishing vessels and results from a research survey by the NOAA Ship Townsend Cromwell conducted in conjunction with the fishing vessels, scientists at the Southwest Fisheries Center have concluded that the prospects are very favorable for establishing a U.S. albacore fishery in the South Pacific. Relatively high catch rates and total catches made by the fishing vessels, coupled with relatively good weather conditions and the infrastructure in Pago Pago, American Samoa, for selling catches and supporting vessel needs, suggest that it is economically feasible for U.S. vessels to operate in the South Pacific. This conclusion is contained in a Technical Memorandum, "U.S. albacore trolling exploration conducted in the South Pacific during February-March, 1986," recently completed for publication by Dr. R. Michael Laurs, Leader of the Fisheries and Environment Task. A companion report prepared by Laurs, Oceanographer Kenneth Bliss and Dr. Jerry Wetherall, Fishery Biologist at the Honolulu Laboratory, summarizes research operations and findings made on the Cromwell South Pacific albacore research survey.

The fishery vessels Day Star and Bald Eagle conducted the exploratory fishing for albacore and made albacore-related scientific observations in the South Pacific. Each vessel received $60,000 in financial support from Saltonstall-Kennedy funds, which were administered by the NMFS Southwest Regional Office and were awarded to the Pacific Fishery Development Foundation in collaboration with the American Fishermen's Research Foundation. In addition to carrying on exploratory fishing, the participating vessels also kept detailed fishing records, conducted albacore tagging operations, and made oceanographic observations. A major objective of the survey was to gain experience necessary to evaluate the feasibility of developing a U.S. troll fishery for albacore in the South Pacific. Such a fishery would operate from January through May, would be centered about 1500 to 2000 miles southeast of American Samoa, and would use the infrastructure in Pago Pago, American Samoa, for selling catches to U.S. canneries, refueling, making repairs, and reprovisioning.

The development of a U.S. albacore fishery in the South Pacific would significantly benefit the U.S. albacore industry by enabling year-around fishing operations. For example, boats could fish in the North Pacific during boreal spring through early fall months when the fishery traditionally operates there, and shift operations to the South Pacific during austral spring and summer months. In addition, the development of a U.S. fishery in the South Pacific would reduce the amount of imports of albacore required to meet the U.S. consumer demand for white meat tuna. At present all albacore canned by U.S. processors in Pago Pago are caught by foreign nations. This amounts to more than 20,000 tons annually with an ex-vessel value in excess of $30 million.

The objectives of the Cromwell cruise were to obtain information for use in developing understanding and improved models of South Pacifc albacore biology, ecology and population dynamics. Data were also collected to describe the physical and biological characteristics of the ocean environment associated with high concentrations of albacore to develop methods of predicting favorable fishing areas and conditions. In addition the distribution and availability of albacore in surface waters of the Subtropical Convergence Zone of the South Pacific were investigated in order to assess the potential for development of a U.S. fishery in the region.

The Cromwell operations were part of a multi-ship investigation which, in addition to the U. S. fishing vessels, also included the New Zealand R/V Kaharoa. A schematic diagram showing the area of operations is shown in Figure 1. The survey was part of an international cooperative effort investigating South Pacific albacore involving the U.S., New Zealand, France, and South Pacific Island nations. Cruise personnel included fishery scientists from the SWFC Honolulu and La Jolla Laboratories, New Zealand Ministry of Agriculture and Fisheries, French ORSTOM in New Caladonia and an observer from the Kingdom of Tonga.

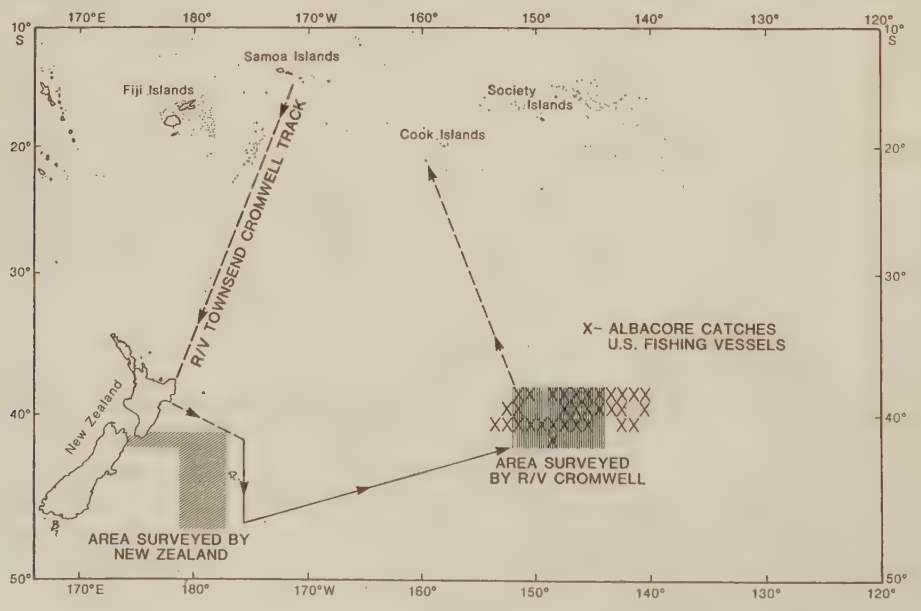

Figure 1. Area surveyed by the NOAA Ship Townsend Cromwell and the New Zealand research vessel Kaharoa.

A full suite of oceanographic measurements and biological sampling of albacore specimens was conducted on the survey (summarized in Tables 1 and 2).

Table 1. Operations summary for the NOAA Ship Townsend Cromwell South Pacific albacore cruise.

Operation	Number of observations
Neuston net hauls	11
Marinovich trawl hauls	6
Isaacs-Kidd trawl hauls	12
CTD casts	32
XBT casts	153
Chlorophyll samples	
Surface	105
At various depths	95

Table 2. Summary of albacore biological sampling.

Sample	No. from Cromwell	No. from Fishing vessels	Total
Gonads	70	0	70
Otoliths	65	83*	148
Heads and viscera	32	0	32
Tails and fillets	33	0	33
Brains and muscle	0	51*	51
Tagged and released			
Injected with tetracycline	22	178	200
Not injected	0	524	524
Total tagged and released	22	702	724

*Collected from frozen fish unloaded at the cannery.

The F/V Day Star caught an estimated 55-1/2 tons of albacore. The vessel was filled to capacity after 29 days of fishing, and delivered 50.6 tons of albacore to the cannery in Pago Pago. The Day Star also tagged and released 602 albacore with an estimated weight of about 5 tons. The Bald Eagle caught about 52 tons of albacore, including 100 fish that were tagged and released. The average weight of the catch was about 17-1/2 pounds. The fishing was carried on within a rather narrow latitudinal range between about 38°30' and 41°30'S. The area of best fishing was between about 141° to 151°W; westward of 151°W the catches dropped off considerably.

Examination of the albacore catch results made by the fishing vessels and the Cromwell and oceanographic measurements that were made concurrently with the fishing revealed:

1) Albacore catches were associated with the Subtropical Convergence Zone (STCZ).

2) Fishing success was highest near the northern boundary of the STCZ.

3) Nearly all albacore catches were associated with sea surface temperature (SST) fronts usually with gradients about 0.5° to 1°C per mile or less.

4) Best catches were made in warm water intrusions.

5) Catches were made in waters having SST's in the range of 16.5° to 19.0°C, with best catches made by fishing vessels at SST's near 18.3° to 18.6°C.

In summary, it appears feasible to establish a U.S. albacore fishery in the South Pacific. Also, from what is known at this time, the South Pacific albacore population is in good condition and can support a surface fishery. However, substantially more fishery exploration and knowledge of the migration patterns and biology of the population are required before a viable U.S. fishery can be successfully developed in the South Pacific. (M. Laurs, FTS 893-6274)

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

An Improvement of Pope's Cohort Analysis Equations Developed

Cohort analysis, also known as virtual population analysis, is one of the most common methods of estimating fish abundance. The procedure consists of adding together fishery catches from each year-class of fish, adjusted for the risk of natural mortality the fish experienced before being caught. The exact solution requires extensive mathematical calculations, preferably by a computer. Approximations requiring much simpler calculations, such as Pope's "cohort analysis," have been popular for this reason. An equally simple but closer approximation than Pope's method was developed by Fishery Biologist Alec MacCall.

The generic problem of cohort analysis can be cast as follows: to estimate the abundance of a group of fish at time t (N_t), given its abundance at time $t+1$ (N_{t+1}) and the catch taken from it during the interval from t to $t+1$ (C_t). For a unit time period (e.g. a year), this relationship is

$$N_t = KC_t + N_{t+1}e^{-M}$$

where M is the rate of natural mortality, and K is a coefficient which is a function of natural and fishing mortality rates (F). Under constant, continuous fishing, the exact value of K is

$$K = \frac{(F+M)(1-e^{-F})}{F(1-e^{-(F+M)})}.$$

The difficulty is that use of this expression requires a value for F, and estimation of that value of F requires a somewhat complicated calculation.

Pope's approximation uses $K = e^{-M/2}$, which is easy to calculate because it does not contain F, and provides abundance estimates that typically are within a few percent of the exact solutions. The new approximation is based on a Taylor series expansion of the exact expression for K, and is $K = M/(1-e^{-M})$. The new approximation is consistently closer to the exact solution, and is as convenient as Pope's approximation. While Pope's approximation treats the catch as if it had been taken instantly at mid-year, the new approximation does not have a corresponding simple interpretation (Alec MacCall, FTS 893-6221).

Analysis Indicates Maturity of Anchovy Is Temperature Dependent

Understanding maturation and egg production in northern anchovy is important in implementing the stock synthesis model. This model analyzes the age composition and abundance of a stock to estimate a time series of recruitment and mortality values. The relation between total biomass and spawn production must be specified in the stock synthesis model because the longest time series of abundance data is based on egg and larval production. This relationship has been assumed to be constant in all previous studies of the population dynamics of northern anchovy, but size-specific maturation data collected by the staff of the Southwest Fisheries Center during 1979 to 1985 indicate that small anchovy tend to be immature in colder years. A longer time series of data on maturity is available from the California Department of Fish and Game (CDF&G) Sea Survey and fishery databases. Richard Parrish and Donna Mallicoate of the Pacific Fisheries Environmental Group and Ken Mais (CDF&G) used these databases to analyze age-specific gonad stage data and found that age 1 female anchovy tended to be immature (gonad stage 1) and to have a lower spawning rate than older anchovy.

Fishery Biologist Richard Methot's analysis of the Sea Survey database indicates that the maturity of anchovy is temperature dependent and that a more precise description of spawn production is to model maturation of age 1 females as a function of temperature, and to calculate from Parrish's study the spawning rate only of mature age 1 females. The portion of the Sea Survey database considered covers the years 1967-85 and covers the region from Pt. Conception, California (34.5°N) to 29.5°N latitude. Cruises were classified into either a winter (primarily February) or a spring (April) period; only one cruise had been at sea during March 12-April 1. Maturation is defined as fraction sexable times fraction of females that are mature (gonad stage greater than 1).

If each trawl is classified into the 1.0 degree surface temperature category measured at that station, the following results are obtained:

	Winter				Spring			
Temp:	<14	14-	15-	16-	<14	14-	15-	16-
N trawls:	99	204	263	159	47	105	124	42
	Mean Fraction Mature							
<80	.00	.00	.60	.63	--	--	--	--
80-89 mm	.05	.36	.52	.55	--	--	--	--
90-99	.13	.36	.72	.75	.08	.40	.59	.80
100-109	.63	.78	.92	.99	.19	.66	.90	.72
110-119	.89	.94	.96	.97	.70	.72	.88	.96
120-129	.88	.99	.98	.98	.82	.83	.95	.98
130-	.93	.99	.99	.95	.86	.91	.96	.94
age 1	.36	.58	.71	.73	.54	.83	.89	.79
age 2	.80	.96	.97	.99	.91	.73	.95	.79
age 3+	.86	.99	.96	.96	.83	.91	.95	.96

Temperature-dependent maturation is most clearly defined when a small size-range is considered. The average age 1 fish is somewhat buffered from the temperature effect because in cold years the age 1 fish tend to be larger. The temperature/maturity relationship is similar when the mean maturity of an age/size category for a cruise is plotted against the mean temperature for that cruise. There was no obvious latitudinal difference in the temperature/maturity relationship (stratified into U.S. and Mexico regions) and no consistent change over time (stratified into 1966-75 and 1976-85).

Sea Survey cruises were not conducted in all years so the temperature/maturity relationship must be related to a readily available temperature index. Maturity of age 1 fish in winter is related to average Scripps pier temperature during January and February by:

$$M = \frac{e^{(a+bT)}}{1 + e^{(a+bT)}} \qquad \text{where: } a = -8.51,\ b = 0.61$$

One might have expected that maturity would be related more to past temperatures than to current temperatures. This was not true; pier temperatures for October to December were poor predictors of maturity, and in the laboratory, Dr. John Hunter and Roger Leong have demonstrated that an immature anchovy becomes mature within a few weeks when the temperature is increased (Richard Methot, FTS 893-6225).

First Cruise for Studying Dover Sole Completed

The first cruise to study Dover sole was conducted during March 4-8, 1986 aboard the NOAA Ship David Starr Jordan. The major cruise objectives were to study the reproductive condition of Dover sole in the area of Morro Bay to Pt. Conception, California, and to obtain live Dover sole to establish a brood stock in the SWFC aquarium. Collections were made with a 400 Eastern trawl (90' footrope, 5' x 7' trawl doors), which was borrowed from the Northwest and Alaska Fisheries Center. Dover sole were collected in each of 7 trawls at depths ranging from 50 to 500 fathoms. Few specimens contained ovaries with ripe eggs, suggesting that most females had already completed spawning. Live Dover sole kept in a chilled live tank were returned to the SWFC in good condition.

Several SWFC personnel made major contributions to the success of this cruise--Fishery Biologist Bill Flerx organized the trawling operations, Biological Technician Eric Lynn organized the reproductive collections, and Fishery Biologist Roger Leong organized the live collections (Richard Methot, FTS 893-6225).

Contractor Supplies Data on Recreational Fisheries in San Francisco Bay

Cynthia Thomson, Industry Economist, received the first 6 months of data from the Bay Area Sportfish Economic Survey from the contractor, CIC Research Inc. She is currently checking the data for errors and possible sources of sampling bias, testing programs, and generating preliminary summary statistics. Over 978 anglers completed and returned questionnaires over this 6 month period. The year-long survey will be completed in July 1986; the data will be used to estimate the value of recreational fishing in the San Francisco Bay and ocean area. (C. Thomson, FTS 893-6387)

Fishing Fleet Productivity Indices Developed

Dr. Dale Squires, Industry Economist, is nearing completion of a study on productivity and industry economic performance of the Pacific coast groundfish trawl fleet. The study examines changes in catch, input usage, and productivity for the years 1981-85 off Washington, Oregon, northern California, and central California for eight species of groundfish. The results will allow monitoring of fleet performance over time and across the different regions. The study examines productivity measurement in general and marine fishing industries in particular. (D. Squires, FTS 893-6209)

OCEANIC FISHERIES RESOURCES DIVISION
La Jolla, California

MARINE MAMMAL INVESTIGATIONS

Technique Developed to Determine Sex of the California Sea Lion from Canine Teeth

While extracting canine teeth from carcasses of California sea lions (Zalophus californianus) to obtain information on age of the animals, Mark Lowry, Fishery Biologist, and Roberta Folk, NOAA Junior Fellow, noted a difference in size between male and female canine teeth. Because sex determination of stranded sea lions is often difficult due to decomposition of soft tissues, Lowry and Folk thought that the size of a canine tooth obtained from a carcass might be used to determine sex. Knowledge of the sex of stranded animals is important to biologists because it helps them to interpret data on stomach contents, skeletal morphology, or other sex-related studies.

Lowry and Folk collected canine teeth from sea lion carcasses that were found on mainland beaches in southern California and the rookeries located on the offshore islands of California. Carcasses varied in size and age from pups to adults. They collected 267 canine teeth from 68 males and 43 females, and took measurements of canines from the left and right and upper and lower sides of the mouth. They measured the maximum crown length, width, and thickness, and the maximum root width and thickness for a total of five measurements per tooth (Figure 1).

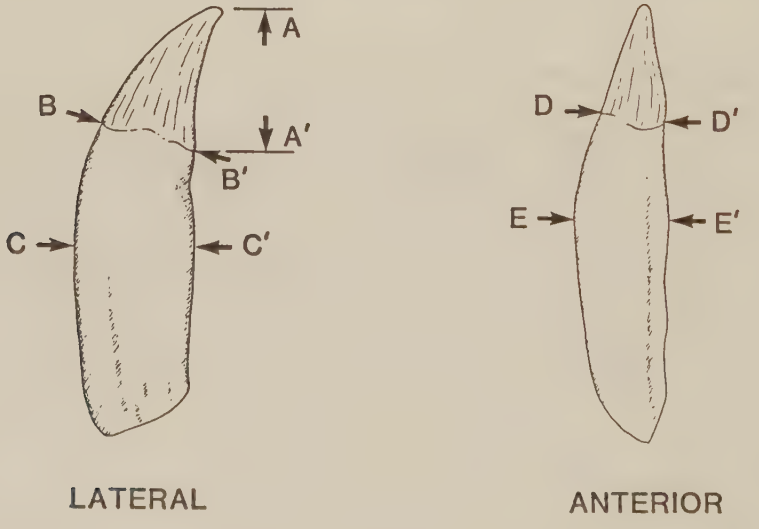

Figure 1. Measurements taken of California sea lion, Zalophus californianus, canine teeth (A-A' is crown width; C-C' is root width; D-D' is crown thickness; and E-E' is root thickness).

Lowry and Folk found a distinct difference in canine size between sexes for all four canines. All five measurements of the canine teeth could be separated into male or female categories. A multivariate ANOVA of each of the five canine locations for each tooth from a specific location showed that the five tooth measurements differed significantly by sex ($P < 0.0001$ in each case). They then performed a stepwise discriminant analysis for each of the four canine locations and produced an equation that can be used to ascertain the sex of a sea lion based on the tooth measurements from one of its four canine teeth.

A representative sample of canine teeth from various age classes of sea lions was photographed (Figure 2) to demonstrate the visual difference in the size of the male and female canines. This series shows that (1) the root increases in length with age while the crown remains constant in width and length and (2) there is a strong difference in the overall size of the canines between sexes for each age class.

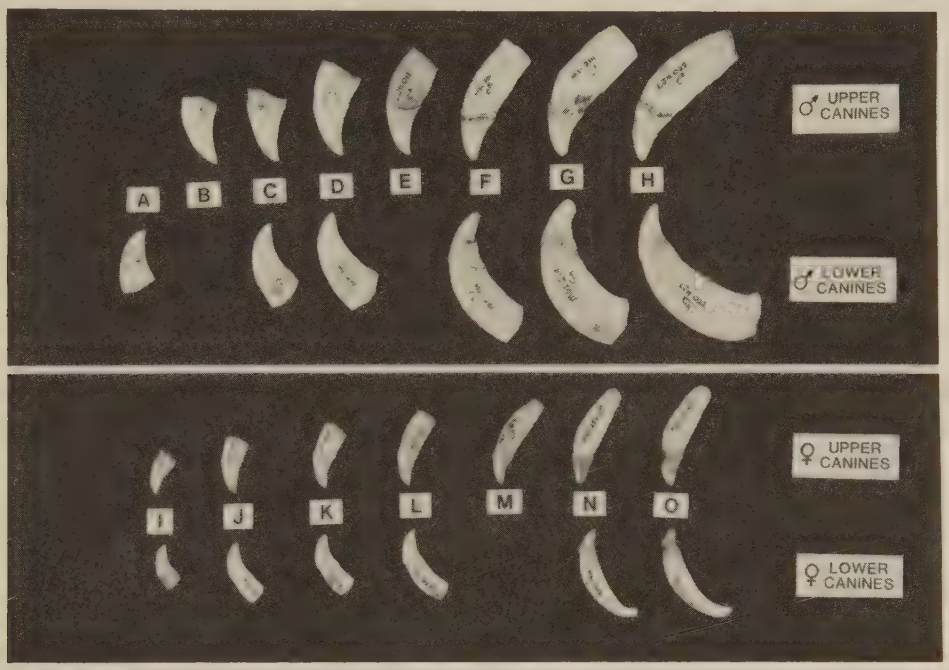

Figure 2. A representative sample of upper and lower canine teeth from California sea lions of known sex, arranged from pup (left) to adult (right).

Lowry and Folk discovered that to use canine measurements for determining the sex of a California sea lion, the crown tooth must be fully developed, or the root must show signs of development. Thus, this technique cannot be used on animals that are too young. They estimate that their procedure can be used to sex male sea lions as young as 5 to 6 months and females as young as 3 to 4 months. (M. Lowry, FTS 893-6347)

TUNA/BILLFISH INVESTIGATIONS

Ages of North Pacific Albacore

Fishery Biologist Earl Weber and Systems Programmer Christina Perrin recently completed the estimation of the age frequency of North Pacific albacore taken in the United States albacore fishery during the 1961-1984 period. Their objective was to develop a data base of catch at age by combining data from one and five degree ocean areas into larger areas appropriate for use in an albacore population analysis models. They first combined sampled size-frequency data into large areas and raised the samples so that the number of fish in the size-frequency data equaled the number of albacore caught in a particular month area stratum. In strata where there were catches but no size frequency data, size-frequency data from an adjacent stratum were substituted. Modal groups of albacore in each month area were then separated using computer routine NORMSEP. Groups were then assigned to ages using an age-length key. The newly created age data set will become input data for several analyses including sensitivity analyses for determining the effects of natural mortality assumptions and correlations with environmental variables to examine recruitment fluctuations. (E. Weber, FTS 893-6214)

BIOLOGICAL INVESTIGATIONS

Nutritional Status of Spotted Dolphins Studied

Alex Aguilar, postdoctoral Fulbright scholar at Scripps Institution of Oceanography working under Dr. William Perrin, Senior Scientist, initiated a series of analyses to determine the lipid content of selected muscle and blubber layers in 61 spotted dolphins captured from a single school. These analyses are the first step in an ongoing project by Aguilar and Dr. Elizabeth Vetter to develop an index of physiological condition for small tropical cetaceans.

The tissues specifically chosen for analysis include dorsal posterior muscle, nuchal blubber, nuchal fat pad, and two layers (inner and outer) of blubber dorsal to the anus. Lipid content of each tissue is determined by extracting tissue lipids with petroleum ether in a Soxhlet apparatus and with gravimetry.

Because tissue lipid content integrates an animal's recent history of feeding success, reflects its physiological fitness and, in many mammal species, correlates strongly with survival and reproductive potential, Aguilar and Vetter have proposed that an index of this nature may be useful for surveying physiological condition of dolphin populations and for detecting temporal or geographic variations in food supply.

Lipid stores are known to vary with age, sex and reproductive status in large whales, and a similar pattern is expected to occur in small cetaceans. Therefore, the first step in this study is to identify sources

of variation within a single population at a given time and locality. The sample of 61 individuals from a single school presents a unique opportunity to do so. Within this group, influence of time and locality is eliminated, and variation found between specimens can be related to the physiological particularities of each animal. Once the patterns of variability within a population are known and the tissue which best reflects individual fat store is identified, Aguilar will be looking for differences in dolphin's physiological condition between seasons, populations, and areas. (A. Aguilar, FTS 893-6251)

MULTISPECIES DATA MANAGEMENT

Dolphin Life History Databases Updated

Biological Technician Ruth Miller completed editing life history data taken from dolphin specimens collected in 1985 by NMFS technicians (observers) aboard tuna purse seiners fishing in the eastern tropical Pacific Ocean. Data were placed into the database, which is maintained by staff of the Multispecies Data Management Project. The dolphin specimens are a sample of the total number ot dolphins that are killed incidentally during tuna purse seining operations. Dolphin life history databases provide a source of information for research on the various species of marine mammals affected by the tuna fishery.

Biological technician Al Jackson reports that a total of 2,216 dolphin life history specimens were collected last year as summarized below.

Specimen type	Number collected During 1985	Collection total (1966-1985)
Female spotted dolphin	761	11,373
Male spotted dolphin	648	8,592
Female spinner dolphin	297	4,552
Male spinner dolphin	300	4,446
Female common dolphin	82	1,290
Male common dolphin	99	1,239
Female striped dolphin	0	132
Male striped dolphin	1	141
Female other species	9	157
Male other species	15	118
Non-sexed specimens	4	73
TOTAL	2,216	32,113

(A. Jackson, FTS 893-6362)

PACIFIC FISHERIES ENVIRONMENTAL GROUP
Monterey, California

PFEG Oceanographer Participates in Antarctic Marine Ecosystem Research at Ice Edge

David Husby, Oceanographer with the Center's Pacific Fisheries Environmental Group, participated in the Antarctic Marine Ecosystem Research at the Ice Edge Zone (AMERIEZ) program February 22 to April 5, 1986 aboard the research vessel Melville in the western Weddell Sea. This program is a multi-year, multi-disciplinary study of the marginal ice edge zone in the Weddell Sea. The purpose of the program is to determine the factors which make the ice edge a zone of high biomass productivity. The program is under the direction of NOAA/NMFS Antarctic Marine Living Resources Program Office; funding for the field work was provided by the National Science Foundation. The Antarctic Marine Living Resources Program is a national effort to provide information for the development and support of U.S. policy regarding the conservation and management of living marine resources in the ocean areas surrounding Antarctica. NMFS researchers from the Northwest and Alaska Fisheries Center and the Northeast Fisheries Center also participated in the marine mammal and zooplankton research projects within the AMERIEZ survey.

In 1986, the AMERIEZ program consisted of a 2-ship survey, the U.S. Coast Guard cutter Glacier and the Melville which began work during the season of maximum ice retreat and completed operations during the beginning of the advance of the ice margin. Husby was responsible for carrying out the physical oceanography work aboard the Melville which consisted of making 500-1500m conductivity/temperature/depth (CTD) casts with a 24-bottle rosette sampler to obtain water samples, both for nutrient analysis and productivity studies and for calibration of the CTD. A total of 49 CTD casts was completed by Husby aboard the Melville. The vertical density structure and water circulation determined from these physical measurements will be combined with the biological and chemical data taken to provide a complete description of the ice edge ecosystem. In addition to analyses of nutrients and productivity, other programs conducted aboard the Melville included assessment of microfloral and faunal composition in the upper 100m (carried out with vertical net tows); sampling of macrozooplankton with hydroacoustic gear and net tows; determining the composition of species in the micronekton while the diet of seabirds was assessed through collection of specimens and analyses of their stomach contents.

On the basis of very preliminary results, Husby reported that data from the biological components of the survey indicated that productivity was relatively low throughout the area surveyed with little enhancement at the ice edge. Diatoms and euphausiids collected showed high levels of stored fat, indicative of preparations for the coming winter. No large swarms of Antarctic krill, Euphausia superba, were found, although krill and myctophid fishes were recorded as the principal components in the food of the seabirds collected. The midwater trawls collected only small numbers of midwater fishes, with most of the samples dominated by krill and salps. Husby noted that seabirds and whales were abundant throughout the

survey area and were concentrated in one region which had been the location of the ice edge several weeks earlier, as indicated from analyses made by the Navy-NOAA Joint Ice Center. (D. Husby (408) 646-3311)

TIBURON LABORATORY

Tiburon, California

UNDERUTILIZED FISHERIES RESOURCES INVESTIGATIONS

New Longline Gear Tested

During a research cruise aboard the NOAA ship David Starr Jordan from February 25 to March 3, cruise leader Sus Kato, Bill Leet and Sennen Salapare of the Underutilized Fisheries Resources Investigations, and guest commercial fisherman Jim Neuberry tested a relatively new type of longline gear and fished samples of underutilized species for trial processing and marketing.

One of the chief objectives of the cruise was to test whether a new longline fishing system, the "Kali" longline system, was effective for catching groundfish species. This method was developed in the Caribbean to circumvent the problem of hooks getting caught on rough bottom. The gear consists of a long main line to which detachable droppers of half-inch plastic pipe are attached at 10-fathom intervals. The poles stand upright on the sea bottom with an arrangement of weights on the bottom and a float on top. Each pole has 10 baited hooks, spaced at five equidistant levels (Figure 1). The gear proved to be effective in catching rockfish, with up

Figure 1. Jim Neuberry, guest commercial fisherman aboard David Starr Jordan, handling catch of vermilion rockfish caught on a "Kali" pole.

to eight vermilion rockfish being taken on one pole. The chief advantage of the gear is its fast deployment and retrieval--30 poles (300 hooks) were set in 15 minutes and retrieved in half an hour. The disadvantages, which are serious enough to preclude commercial use of the gear at present, are baiting time is too long (though not much more than other hook-and-line methods, and storing the poles requires special racks. These problems are not difficult to overcome, and it is likely that this gear will become part of the hardware commonly used by fishermen on the Pacific Coast in the near future. Task members will continue to develop this gear with cooperating commercial fishermen.

A second objective of the cruise was to provide market samples of ocean whitefish and box crab. The box crabs were caught in Hawaiian fish traps, made of chicken wire with a unique entrance which is effective in not allowing escape of trapped fish. Best catches of box crabs were around 6 pounds per trap after a two-day soak. The best fishing depths were between 140 to 160 fm; traps set in shallower depths caught fewer box crabs. Several large cowcod and small sablefish were also caught in the traps. The box crabs were kept alive in the ship's bait tank.

Ocean whitefish were caught on the Kali gear as well as on rod and reel in depths of 25-50 fm. Most of the fish were also kept alive in the bait tank.

Another objective of the cruise was to learn more about the distribution of spot prawn. Traps for these sweet shrimp, used extensively in Japanese "sushi" restaurants, were set in depths of 80-160 fm at several locations. Only Catalina Canyon produced shrimp. The Jordan left the area, however, when a commercial shrimper started fishing in the same spot. The shrimper went to Catalina Canyon on Kato's advice and reportedly caught a lot of shrimp there. No shrimp were found near Cortez and Tanner Banks.

After the vessel returned to port, the whitefish were killed and bled and the box crabs were transported alive to San Francisco. A few crabs and whitefish were given to a restaurant owner in San Diego. The animals were distributed to wholesalers, brokers, and restaurateurs in San Francisco. According to food preparers and consumers, ocean whitefish was excellent whether eaten raw as "sashimi," broiled, or steamed Chinese style. Prices offered by a fish broker for this fish approached the price of California halibut, which is one of the most expensive fish caught in local waters.

Box crabs, on the other hand, produced a mixed reaction. Although the flavor and texture of the meat were judged excellent by nearly all who tried it, the yield of meat and the difficulty in extracting it were cited as deterrents to marketing. Crabs larger than 1-1/2 lb were acceptable and can probably be used as a substitute for Dungeness crab in Chinese and traditional San Francisco cuisine. The meat yield was about 24-28% of the total weight, significantly more than that for rock crabs (Cancer sp.) and about the same as that for Dungeness crabs (Cancer magister). Further inquiries have uncovered several possible markets, and Kato is now working with two fishermen who will conduct trial commercial fishing for box crabs. (S. Kato, FTS 556-0565)

GROUNDFISH PHYSIOLOGICAL ECOLOGY INVESTIGATIONS

Health and Condition of Groundfish Studied

A major objective of the Groundfish Physiology Ecology Investigation is to study how the condition of spawning adults relates to the survival of the eggs to juveniles and to be able to forecast recruitment. As part of the objective and for preparation of an annual report on the health and condition of yellowfin rockfish (Sebastes flavidus), bocaccio (S. paucispinis), widow rockfish (S. entomelas), and chilipepper (S. goodei), staff of the Groundfish Investigation collected monthly samples of these four species for a year and they are now summarizing the data. They concentrated on yellowtail rockfish because of its suitability for research and its relative commercial and recreational importance.

Preliminary results showed a heavy rate of infection of yellowtail rockfish by certain parasites which could affect condition. The first step was to ascertain the taxonomic classification of the parasites. Dr. Jeannette Whipple, Investigation Chief, and Dr. Michael Moser, U.C. Santa Cruz, worked on the identification of parasites, particularly in yellowtail rockfish.

Two parasites appear to be of major importance in potentially affecting the condition of yellowtail rockfish. The first is a protozoan occurring on the bulbus arteriosus of the heart, which was positively identified through gross examinations and histopathological slides as Henneguya sebastoda. The prevalence of this parasite in yellowtail rockfish, based on gross examinations, was 42%. Although it occurred in the other species, it was found most often in yellowtail rockfish.

The second parasite discovered is a species of fungus that resembles Ichthyophonus and has not yet been identified. It occurs in small white patches embedded within the spleen, head kidney, and, occasionally, the liver. Slides and photographs have been sent to a specialist for positive identification, and Fishery Biologist Maxwell Eldridge has furnished freshly excised material to Dr. Renee Rosemark, a microbiologist at the Bodega Marine Laboratory, for culture and identification. This organism is found in yellowtail rockfish from gross examination in approximately 94% of the spleens and 90% of the head kidneys. It occurs in the other species, but is most prevalent in yellowtail rockfish, followed by widow rockfish, bocaccio, and chilipepper.

Preliminary examination suggests that these parasites may affect growth and condition of yellowtail rockfish. Analyses are being done to determine associations of infections by these two organisms with size-age distribution of the rockfish, as well as various other measures of condition, including fat content of tissues. (J. Whipple, FTS 556-0565)

GROUNDFISH ANALYSIS INVESTIGATION

Groundfish Mesh-Size Study Group Formed

The National Marine Fisheries Service and the Pacific Fishery Management Council manage groundfish caught off California, Oregon, and Washington through a complex system of quotas, trip limits, and gear regulations. Trip limits have been used for several species of rockfish to keep annual landings at or below quotas, while attempting to maintain a yearlong fishing season. It appears that trip limits will also be necessary to maintain a yearlong fishery for sablefish. The trip limits have caused enforcement problems, discards of fish, and reduced fishing efficiency. The problems caused by trip limits have resulted in requests from the fishing industry that studies be conducted to determine if changes in mesh size would reduce the need for quotas and trip limits.

Dr. William Lenarz, Chief of the Groundfish Analysis Investigation, participated in a meeting at the University of Washington April 23 on the subject of mesh-size studies. Representatives from the fishing industry, Sea Grant programs of California, Oregon, and Washington, Oregon State University, the University of Washington, three state fisheries agencies, and the NMFS Northwest and Alaska Fisheries Center also participated in the meeting.

During the meeting participants agreed that mesh-size studies deserved serious consideration, that such studies would be fairly expensive, and that the studies would probably take more than a year to complete. A group was created to prepare a proposal for the study. Part of the group, of which Lenarz is a member, will prepare the technical aspects of the proposal. This work will include incorporation of available data into models to estimate the potential benefits from changes in mesh size and to further specify questions that need to be answered by mesh-size studies. The second part of the group will develop sources of funding and procedures for coordinating what is likely to be a multi-agency study. There was considerable enthusiasm expressed at the meeting and the work of the planning group is in progress. (W. Lenarz, FTS 556-0565)

GROUNDFISH COMMUNITIES INVESTIGATION

Early Samples Indicate Young-of-the-Year Rockfishes Are Fewer in 1986

Last year produced an exceptionally large number of young-of-the-year rockfishes, Sebastes spp. (as described in the January-February 1986 Report of Activities). Based on the numbers sampled this past April, however, the current year class seems to be considerably smaller or is arriving later. This indication results from a cruise by members of the Fish Communities Investigation aboard the NOAA Ship David Starr Jordan in the Gulf of the Farallones off San Francisco. Fishing with a midwater trawl, Cruise Leader Pete Adams, with Fishery Biologist Susan Smith, Fishery Technician Dan Howard, and Biological Aid Wayne Samiere, took 0 to 5 juveniles, 15 to

25 mm standard length, in each haul. In comparison, these same investigators, using the same methods in the same area last April, took 0 to 422 juveniles, 30 to 40 mm standard length, in each haul. Despite this difference, however, the samples from the two years are similar in that the chilipepper, Sebastes goodei, has been the dominant species both times. (P. Adams, FTS 556-0565)

FISHERIES INFORMATION SYSTEMS & ADP

Department of Commerce Converting NOAA Personnel and Payroll Records to Department of Agriculture's National Finance Center

Effective on June 8, 1986, the Department of Commerce will convert all NOAA personnel and payroll records to a system to be operated by the U.S. Department of Agriculture's National Finance Center(NFC). In preparation for the conversion the DOC system will be run in parallel with the computerized system of the NFC for test purposes. This has meant that Center timekeepers complete the Time and Attendance Forms manually for the two systems. The forms completed in accordance with the Agriculture system are mailed to the Western Administrtive Service Center in Seattle where they are keyed into the remote data entry system by key operators under contract to WASC.

To learn more about the data requirements for the Agriculture Department's T&A system, the ADP operations staff at La Jolla attended portions of the 2-day payroll system training session. The class, which was taught by Administrative Assistant Barbara Engstrand on February 19 and 20, also included participants from other mainland units of the Southwest Fisheries Center and from the Southwest Region.

To help the timekeepers who were preparing the T&A's by hand, Rob Bistodeau, Computer Analyst, created an interim Time and Attendance data entry program on the 32X microcomputer. The constant data elements and some of the variable data elements on the T&A report for each employee will be printed out on the forms at the beginning of each pay period.

At this time the DOC is developing enhancement to the T&A remote entry program. When fully tested, the program will be distributed to the field stations for implementation on an IBM or IBM-compatible microcomputer. This remote entry program will permit the timekeeper to enter the data for each employee onto floppy diskettes. Until communication capability is established in WASC, the diskettes will be mailed to Seattle for entry into the NFC system. ADP staff at La Jolla is checking into the possibility of transmitting the data onto the NFC system. (D. Roll, FTS 893-6250)

Development of Computerized Shipboard Data Collection System Continues

Susan Jacobson, Computer Systems Programmer, and Rob Karstein, Computer Programmer Analyst, have been developing a computerized Shipboard Data Collection System for some months. After Karstein resigned in mid-February to accept a position in private industry, Director Barrett decided to re-assign this aspect of his duties to Electronics Engineer Jack Brown.

Last month Brown tested and monitored the CAMAC/Molecular interface under conditions at sea during the northward trip of the Jordan to Tiburon. Based on his analyses of the equipment in operation, he has made modifications to the data collection software module in the CAMAC.

Brown has also written and implemented an assembly program which permits the CAMAC to be initialized directly from the Molecular in 2 minutes rather than the 20 minutes required from the TI terminal. (D. Roll, FTS 893-6250)

MISCELLANEOUS

PUBLIC AFFAIRS

Honolulu Laboratory

April 29 - Laboratory Director Richard Shomura spoke to Dr. James Parrish's fisheries class at the University of Hawaii.

La Jolla Laboratory

Committee Reviews SWFC Programs

From March 24 to 26 a group of scientists came to the Center to review SWFC programs, goals and objectives. The committee included Dr. John Harville, Consultant for Pacific Marine Fisheries Commission; Dr. Alfred Beeton, Director of the Great Lakes and Marine Waters Center, University of Michigan; Dr. Paul Callaghan, Associate Professor, College of Business and Public Administration, University of Guam; Mr. Gene DiDonato, Assistant Director of Washington State Department of Fisheries; Dr. Robert Francis, Director of Fisheries Research Institute, University of Washington; Mr. Bert Larkins, General Manager, Marine Resources Company.

From left to right, Bert Larkins, Gene DiDonato, Robert Francis, John Harville, Alfred Beeton, and Paul Callaghan.

Jim Thrailkill Retires after 42 Years of Federal Government Service

More than 100 friends and co-workers honored fishery biologist Jim Thrailkill at a retirement party April 25 in the Martin Johnson House at the Scripps Institution of Oceanography. With a swami, a dancing girl, balloons, gifts, and some tears, the guests showered Thrailkill with toasts and best wishes for a long and happy retirement. Ending his career in federal service as the leader of the Coastal and Pacific Fisheries Investigation within the Coastal Division at La Jolla, California, Thrailkill was responsible for cruise planning and logistics for the NOAA Ship Jordan and before that for its predecessor, the Black Douglas. Many of the guests at the retirement party were former employees who had worked for Thrailkill as biological aides and technicians.

Although Thrailkill's government service included several years in the Army during World War II and a stint with the U.S. Geological Survey as a surveyor, his career with the fisheries service began in 1949 when he transferred to the Sardine Investigation of the then U.S. Fish and Wildlife Service in San Diego. Among his first duties was to help organize the monthly series of cruises aboard the Black Douglas designed to investigate the catastrophic decline in the landings of the Pacific sardine.

In the following years, Thrailkill continued to supervise the planning of research cruises and the processing of plankton samples and data reduction. He is the author of the series of Special Scientific Reports on zooplankton volumes off the Pacific Coast, co-author of several papers on the subject of plankton volume loss with time of preservation, and collaborator on the development of a high speed plankton sampler.

Thrailkill with former employees: (Back) Fran Pocinich, Connie Fey, Dimitry Abramenkoff, Alice Lumpkins, Jim, Rich Charter, Carol Miller, Brad Earhart. (Front) Lucy Dunn, Bill Flerx, Debbie Snow, Cindy Meyer, Mary Farrell.

Thrailkill's retirement represents a further thinning of the ranks of the post World War II generation of fishery biologists at the Southwest Fisheries Center, many of whom completed their college education with the help of the GI Bill.

Thrailkill indicated that he plans to divide his time between his homes in Idaho and San Diego and that he intends to make good use of the custom trout fishing rod and golf bag he received among his many gifts.

Center Scientist Presents Seminars on Cetaceans to High School Students

Dr. Al Myrick had a busy "Meet-the-Scientist" schedule in April. He presented three seminars to an Oceanography class of 11th and 12th graders at Gompers Secondary School in San Diego. On April 14th he gave a talk entitled "Form and Function of Cetaceans," on the 21st he spoke to the class on "Behavioral Adaptations of Pelagic Dolphins," and on April 28th he was back to deliver a mini-seminar on "Cetaceans and Cetacean Research."

In addition to presenting talks this month, Myrick served as one of the judges at the Greater San Diego Engineering and Science Fair. During the Fair, on April 12th and 13th, Myrick counseled Fair entrants in the sections of Biology and Earth Sciences on career plans, experiment design, and report presentation. Next month, Myrick will serve as judge to the California Science Fair to be held at Exposition Park in Los Angeles in late May.

Dr. Albert Myrick explains age determination to winners of the San Diego Science Fair.

Tiburon Laboratory

March 21 - Carol Reilly presented a general discussion and slide show about fish at Montclair Elementary School in Oakland.

8 - Norman Abramson, Joseph Hightower, and William Lenarz participated in a stock Assessment Workshop for Fishermen, sponsored by NMFS, the Marine Advisory Service of the University of California, and the Fishermen's Marketing Association. Abramson chaired the workshop, Hightower spoke on "Dynamic pool model and computer modeling for optimum fishery management," and Lenarz spoke on "Cohort analysis." Other speakers were Ellen Pikitch, Oregon State University, on "Stock reduction models" and Tom Dark, Northwest and Alaska Fisheries Center, on "Swept area and hydroacoustic surveys." There was also a discussion session on cooperative industry/scientific community research. The workshop was held in the Fishermen's Marketing Association meeting room in Eureka, California.

April 17 - Sharon Moreland participated in a career day at St. Joseph's of Notre Dame High School in Alameda. She presented the slide show prepared by the Southwest Fisheries Center and spoke on the career of Fishery Biology.

PRESS RELEASES

Honolulu Laboratory

March 11 - "NMFS Research on Captive Monk Seal Needed to Help Save the Species."

21 - "South Pacific Albacore Research."

April 23 - "New Reporting System for Western Pacific Fisheries Developed."

29 - "Fishery Resources Surveyed with Deep-Sea Camera."

SEMINARS

Honolulu Laboratory

March 14 - Dr. Richard E. Brock, Hawaii Institute of Marine Biology and UH Sea Grant College Program, spoke on "Preliminary Biological Results of a Saltonstall-Kennedy Artificial Reef Project."

28 - Robert B. Moffitt, Fishery Biologist, spoke on "Some Deepwater Molluscs from the Marianas."

April 11 - Dr. Kim Holland, Hawaii Institute of Marine Biology, UH, spoke on "Possible Strategies for Fish Aggregating Device (FAD) Deployment Based on Tuna Tracking Data."

La Jolla Laboratory

March 6 - Dr. Graham Worthy, Department of Zoology, University of Guelph, Ontario, Canada, presented a seminar on "Interactions between Harp Seals and Commercial Fisheries: Biology and Politics."

April 3 - Dr. Jeffrey Waugh, Department of Economics, University of New South Wales, Australia, discussed "Cooperative Fishing Arrangements and Comparative Advantage in the South Pacific Tuna Fishery."

15 - Dr. Richard C.J. Somerville, Scripps Institution of Oceanography, presented a seminar on "Expert Systems in Meteorology."

29 - Ms. Pauline Rippel of Methods gave a seminar on "Team Building." The seminar was sponsored by the Federal Women's Program.

Tiburon Laboratory

March 26 - Dr. Wayne Getz, Division of Biological Control, University of California, Berkeley, spoke on "Managing variable marine fisheries," as part of the Tiburon Seminar Series, a cooperative effort of the Paul F. Romberg Tiburon Center for Environmental Studies (San Francisco State University) and the Tiburon Laboratory.

April 23 - Dr. Steven Obrebski, San Francisco State University, spoke on "Evolutionary significance of geographic variation in herring," as part of the Tiburon Seminar Series, a cooperative effort of the Paul F. Romberg Tiburon Center for Environmental Studies (San Francisco State University) and the Tiburon Laboratory.

HONORS AND AWARDS

Honolulu Laboratory

March 7 - The Honolulu Laboratory nominated Dr. George W. Boehlert as Manager/Supervisor of the Year and Janet L. Pappas as Employee of the Year (Professional, Administrative,

Technical) for the Honolulu-Pacific Federal Executive Board's 1986 Federal Day event.

April 18 - The Southwest Fisheries Center nominated the following Honolulu Laboratory papers for consideration as the 1985 Outstanding NMFS Publications:

Fishery Bulletin, Vol. 83: Gerrodette, T., D. Goodman, and J. Barlow. 1985. Confidence limits for population projections when vital rates vary randomly. Fish. Bull., U.S. 83(3):207-217.

Marine Fisheries Review, Vol. 46: Uchida, R. N., and D. T. Tagami. 1984. Groundfish fisheries and research in the vicinity of seamounts in the North Pacific Ocean. Mar. Fish. Rev., 46(2):1-17.

La Jolla Laboratory

March 20 - Dr. Albert Myrick received a Special Act Award for consistent and outstanding efforts to acquaint the young people of San Diego with NMFS research projects.

VISITORS

Honolulu Laboratory

March 3 - Dr. Leighton Taylor, Director, Waikiki Aquarium, met with Richard Shomura and William G. Gilmartin.

- Mary Yoklavich, Oregon State University Cooperative Institute for Marine Resources Studies, visited George Boehlert to discuss research and work on coauthored manuscripts.

7 - Richard Shomura was visited by Ken Alameda and Garry J. Day, Ocean Ventures, Inc., San Diego, Calif.; Masamichi Ito, Mitsubishi Corporation, Los Angeles Branch; Muneo Baba, Mitsubishi Corporation, Tokyo; Noburo Tsuneda, Hagoromo Canning Corporation, Shimizu, Japan; and Tomoyuki Kubota, Hagoromo Canning Corporation, Yaizu, Japan.

- Henry Sakuda, Director, Division of Aquatic Resources, visited R. Shomura and W. Gilmartin to discuss a permit for monk seal research at Kure Atoll.

10 - Richard Shomura and William Gilmartin met with Dr. Philip Helfrich, Director, Hawaii Institute of Marine Biology, and Bruce Carlson, Reid Withrow, and Wayne Gocke of the Waikiki Aquarium, to discuss problems regarding several young monk seals placed at the Aquarium by the Honolulu Laboratory.

12 - Kelley Dean, KITV-4 Television news reporter, interviewed Richard Shomura, and Mary Zanacus, KHON-2 Television news reporter, interviewed William Gilmartin.

14 - Richard Shomura was visited by Allen M. Shimada, Fishery Biologist, Northwest and Alaska Fisheries Center, Seattle, Washington.

18-28 - Hans Hansen, Office of Inspector General, Department of Commerce, San Francisco, California, visited the Laboratory and met with Richard Shomura, George Boehlert, Robert Skillman, Jerry Wetherall, and Fletcher Riggs.

20 - R. Adm. Robert Sandquist, Director, Pacific Marine Center, and Lt. Cdr. David McConaghy, Commanding Officer, NOAA ship Townsend Cromwell, visited George Boehlert and Jerry Wetherall to discuss vessel and equipment needs.

26 - Dr. Amode R. Sen, Calgary, Alberta, Canada, met with George Boehlert and Robert Skillman, and Sam Pooley, and with Richard Shomura on March 29.

27 - Dr. Victor I. Ilytchev, Director of the Pacific Institute of Oceanology, Far Eastern Science Center, Vladivostok, USSR, visited George Boehlert to discuss plans for the upcoming Marine Science Symposium in Nahodka.

28 - Hassan Maizan, Senior Fisheries Officer, Republic of Maldives, accompanied by Dr. Willis Moore, U.S. Information Agency Reception Center, visited Richard Shomura.

April 8 - Dr. Jed Hirota, Department of Oceanography, UH, visited George Boehlert to work on a joint Sea Grant proposal relating to seamounts.

La Jolla Laboratory

March 4 - Mr. Ito from Mitsubishi Foods in Los Angeles visited with staff of the Oceanic Division to discuss albacore. Ito is the host of a Japanese canner of albacore who will be purchasing U.S. fish.

April 7- 8 - Herb Frey, Steve Crooke, Don Schultze, Rob Collins, Mark Helvey, Svein Fougner, and Susan Smith attended the Recreational Fisheries Technical Task Force at the Center.

14 - Jim Lake, Confidential Assistant to Kay Bulow, Department of Commerce Deputy Secretary for Administration, Washington, D.C., visited the Center.

16-17 - Paul Spizzirri, Chief of Small Purchasing, WASC, Seattle, Washington, visited the Center.

17 - A small group of delegates from the People's Republic of China met with staff at the Center.

21 - Hassan Maniku Maizan, Senior Fisheries Development Officer, Ministry of Fisheries, Male, Republic of Maldives, visited the Center.

24 - Angela Quinn, Workman's Compensation Specialist, Personnel Division, WASC, and Dr. Bonefield, Public Health Service, Seattle, Washington, visited the Center as part of a Workman's Compensation Cost Containment Study.

28 - Dr. Hiromasa Yoshikawa, the Foundation of Interdisciplinary Research Institute of Environmental Sciences, Kyoto, Japan, met with Reuben Lasker of the Coastal Division.

Pacific Fisheries Environmental Group

March 19 - Jim Hardwick, California Department of Fish and Game, visited with Paul Sund and discussed historical fishery data series.

April 9 - Sus Kato of the Tiburon Laboratory visited with staff members. Kristine Hagenmeyer Sanchez, promotional coordinator for the Monterey Squid Festival joined them in discussions of SWFC participation in the Festival.

17-19 - Tina Echeverria of the Tiburon Laboratory visited Paul Sund and Jerry Norton to discuss environmental factors related to groundfish larvae. Dr. Jim Mueller of the Naval Postgraduate School joined in discussions of satellite applications.

Tiburon Laboratory

March 3 - John Butler, La Jolla Laboratory, met with David Woodbury to work on interfacing a La Jolla Standard computer with a digitizer to be used to study juvenile rockfish daily growth.

6 - Munehara Tokimura, University of Tokyo, met with Sus Kato to learn about the Tiburon Laboratory's research.

18 - K. Takayama, Wescon International, San Bruno, California, met with Sus Kato to discuss processing and marketing of some underutilized species of fish.

20 - Diana Watters and Debbie Schlafmann, California Department of Fish and Game, Monterey, met with David Woodbury to learn to age blue rockfish and to determine whether otoliths collected in the NMFS/CDF&G port sampling program could be used to study El Niño effects on blue rockfish.

21 - George Zorzi, Carmichael, California, met with Sus Kato to pick up samples of skates and rays collected by Kato on cruises aboard the NOAA Ship David Starr Jordan.

24 - Will Murray of the Nature Conservancy met with Jeannette Whipple.

25 - Jane Kay and Paul Glines of the San Francisco Examiner interviewed Jeannette Whipple.

April 10 - Frank Henry, California Department of Fish and Game, Menlo Park, met with members of the Groundfish Analysis investigation to discuss the cooperative sampling program.

28 - Dick Nelson, Northwest and Alaska Fisheries Center, Seattle, met with Sus Kato and Norman Abramson to discuss current research programs.

MEETINGS AND TRAVEL

Honolulu Laboratory

March 3- 5 - Director Barrett, Richard Shomura, and George Boehlert and Robert Skillman participated in the 52d meeting of the Western Pacific Regional Fishery Management Council at the Ala Moana Americana Hotel.

5 - Richard Shomura attended a meeting called by Kent Keith, Director, Hawaii Department of Planning and Economic Development, on the proposed Hawaii Ocean Center.

5-16 - George Boehlert traveled to the Fisheries Research Centre, Wellington, New Zealand, where he met with scientists from the deepwater fisheries section and presented a seminar. The goal of the visit was to explore the possibility of developing a cooperative research program between the two laboratories.

6 - Richard Shomura participated in a meeting of the Pacific Fisheries Development Foundation at the Ala Moana Americana Hotel.

12 - Richard Shomura attended a meeting of the Sea Grant Advisory Council at the University of Hawaii.

19-28 - Richard Shomura traveled to California to participate in the SWFC program review (March 24-26) and the Center Management meeting (March 27-28) in La Jolla.

April 1 - George Boehlert, Stephen Ralston, Robert Skillman, and Sam Pooley attended a meeting of the bottom fish planning team to discuss formation of a monitoring team, and access management concepts.

2 - Richard Shomura and George Boehlert participated in the Joint UH-NOAA Institute for Marine and Atmospheric Research annual review.

3- 4 - Richard Shomura attended the 11th Annual Albert L. Tester Symposium at the UH.

8-11 - Richard Shomura traveled to Seattle to attend a meeting concerning the Foreign Observer Program and to meet with R. Adm. Robert Sandquist, Director, Pacific Marine Center, Carolyn Riley-Payne, Western Administrative Service Center, and Ben Jones and Dr. Gary Stauffer, Northwest and Alaska Fisheries Center.

19-26 - George Boehlert traveled to Ciudad del Carmen, Campeche, Mexico to attend the Workshop on Recruitment in Tropical Demersal Systems. The meeting was organized under the auspices of the UNESCO Intergovernmental Oceanographic Commission and the FAO, United Nations and included participants from a variety of countries. Dr. Boehlert presented a paper, "An approach to recruitment research in insular ecosystems."

23 - Richard Shomura attended a steering committee meeting of the Honolulu Area Combined Federal Campaign at the Hickam Air Force Base.

April 25 - Richard Shomura attended an Office of Personnel Management briefing on Gramm-Rudman-Hollings Law at the Prince Jonah Kuhio Federal Building. The speaker was Stanley E. Collender of Washington, D.C., who has served on the House and Senate budget committees.

30 - Richard Shomura and Sam Pooley, Industry Economist, convened a 2-day workshop, "Forces of Change in Hawaii's Aku (Skipjack Tuna) Industry--Resource and Industry Issues." The workshop was sponsored by the following organizations: Hawaii Division of Aquatic Resources, Southwest Fisheries Center, Tuna Boat Owner's Co-op, Inc., United Fishing Agency, UH Sea Grant College Program, and the Pacific Regional Fishery Management Council.

La Jolla Laboratory

January 26 - March 4 - Ken Bliss traveled to Honolulu, Hawaii, to participate in the cruise to conduct biological and hydrological survey of albacore grounds in the South Pacific.

January 28 - March 4 - Michael Laurs traveled to Honolulu, Hawaii, to participate in the cruise in the South Pacific to conduct biological and hydrological survey of albacore grounds.

February 14 - March 5 - Reuben Lasker traveled to Hobart, Tasmania, and Wellington, New Zealand, to give a keynote address to Australian Marine

Sciences Association, to confer with fisheries research scientists in Hobart and Wellington, and to hold a workshop in New Zealand.

February 22 - May 30 - Nancy Lo presented lectures on statistical applications in fishery research at the Institute of Statistics and School of Fishery, Taipei, Taiwan.

March 2- 5 - Izadore Barrett attended the 52nd Western Pacific Council meeting in Honolulu, Hawaii.

3- 4 - John Butler went to Tiburon, California, to assist in the installation of computer equipment.

3- 7 - Al Coan traveled to Mayaguez, Puerto Rico, to visit sampling sites and to help in the transfer of an employee to the Southeast Fisheries Center in Miami, Florida.

3-14 - Dan Huppert attended an OPM Executive Seminar course in Denver, Colorado.

7-10 - Charles Oliver censused and tagged northern elephant seals on San Clemente Island.

7-10 - Mark Lowry traveled to San Nicolas Island to census and tag elephant seal pups.

8 - Priscilla Akin and Cynthia Thomson traveled to Los Angeles to attend a workshop sponsored by Women in Management.

9-10 - Director Izadore Barrett traveled to Portland, Oregon, to attend the Pacific Council's Scientific and Statistical Committee meeting.

25-28 - Jay Barlow went to San Francisco to attend a "Workshop on measures to address marine mammal and fisheries interactions in California," which was sponsored by the Marine Mammal Commission.

28-31 - Jeanne Wexler censused and tagged elephant seals on San Clemente Island.

March 30 - April 4 - Steve Reilly traveled to Woods Hole, Massachusetts, to participate in NMFS National Workshop on Assessment of Environmental Effects.

March 31 - April 1 - Roger Leong traveled to Morro Bay, California, to pick up samples of fish.

March 31 - April 4 - Alec MacCall attended a NMFS workshop on incorporating habitat issues in fishery models and management, Woods Hole, Massachussetts.

April 2- 6 - William Perrin, Mark Lowry, and Aleta Hohn participated in the 11th International Conference on Marine Mammals in Guaymas, Mexico.

3- 4 - Izadore Barrett traveled to Davis, California, to attend a Sea Grant meeting.

7- 8 - Izadore Barrett traveled to Eureka, California, to attend the Pacific Council's Scientific and Statistical Committee meeting.

7- 8 - Daniel Huppert participated in the Pacific Fishery Management Council's Scientific and Statistical Committee meeting in Eureka, California.

7- 8 - The Marine Recreational Fisheries Technical Task Force met on April 7 to 8, 1986, to construct a 10-year scenario for California recreational fisheries. The scenario will be presented to recreational fishery constituents at a workshop on June 9-11 at the SWFC in La Jolla. The scenario will be used to stimulate discussion on the future of recreational fisheries. The Task Force is made up of staff from California Department of Fish and Game and the Southwest Fisheries Center and Region (see photo).

From left to right: Herb Frey, Jim Squire Don Schultze, Cynthia Thomson, Steve Cook, Dave Mackett, Svein Fougner, Allen Baracco, Susan Smith, Rob Collins, and Mark Helvey.

14-15 - Gary Sakagawa attended an Atlantic tuna research planning meeting in Miami, Florida.

21-25 - Daniel Huppert participated in a workshop on management alternatives for the north Pacific longline fishery sponsored by the University of Alaska Sea Grant in Eastsound, Washington.

April 23 - May 1 - Michael Prager went to Norfolk, Virginia, to confer with colleagues at Old Dominion University.

April 23 - May 5 - Jay Barlow, Peter Boveng, Randy Rasmussen, and Stephanie Sexton traveled to San Francisco to board the David Starr Jordan to participate in a harbor porpoise cruise.

April 24 - May 3 - Rennie Holt and Charles Oliver traveled to San Francisco, Santa Rosa, Watsonville, and Santa Barbara, California, to conduct experiments on harbor porpoise with helicopter and the David Starr Jordan.

April 29 - May 3 - Gary Sakagawa traveled to Honolulu, Hawaii, to attend a workshop on the Hawaiian tuna industry.

Pacific Fisheries Environmental Group

March 11-12 - Rosemary Troian attended training in Redwood City on the new timekeeping system.

20 - Paul Sund visited Tom Dohl at the University of California, Santa Cruz, Long Marine Laboratory to obtain materials for a public talk.

24-26 - Andy Bakun and Dick Parrish traveled to SWFC to participate in the Center Program Review. Bakun remained at SWFC on March 27 for the Center Management Meeting.

March 29 - April 6 - Andy Bakun traveled to Paris to assist in preparation of a summary report of status of the Ocean Sciences in Relation to Living Resources program.

March 26-28 - Jerrold Norton attended the Workshop on Climate Variability of the Eastern North Pacific and Western North America at Asilomar Conference grounds. The workshop was sponsored by the U.S. Geological Survey.

April 19-26 - Andy Bakun participated in an OSLR International Recruitment Programme Workshop on Recruitment in Tropical Coastal Demersal Communities in Ciudad de Carmen, Campeche, Mexico. Bakun attended at the invitation of the Intergovernmental Oceanograpic Commission.

April 23-24 - Dick Parrish and Jerry Norton attended the National Science Foundation El Niño Planning Conference at Moss Landing Marine Labs. They both gave presentations on recent PFEG research.

April 30 - A paper authored by Roy Mendelssohn was read for him at the "Workshop on Forces of Change in Hawaii's AKU (skipjack) Industry." Mendelssohn's paper is titled "Environmental Influences on Skipjack Availability."

Tiburon Laboratory

March 24-28 - Norman Abramson attended the Center Program Review and Center Management Meeting at the Southwest Fisheries Center in La Jolla.

26 - Bill Leet attended a marine mammal workshop in San Francisco for a discussion on alternate fishing methods.

25 - Edward Ueber met with Dr. Peter Bushnell, Director of Economics of the New Zealand Ministry of Agriculture and Fisheries to discuss fish products, markets, and fishery management, and Ueber arranged meetings for Bushnell with processors and bankers.

April 3- 4 - Norman Abramson and Bill Lenarz attended a meeting at the University of California, Davis, which addressed rockfish research issues which might be conducted under Sea Grant.

3- 5 - Edward Ueber chaired a session on Groundfish Management at the annual meeting of the Pacific Fisheries Biologists in Eureka, California. Dan Howard, Sharon Moreland, Wayne Samiere, Susan Smith, and Dave Woodbury also attended.

3- 9 - Sus Kato and Sennen Salapare traveled to San Diego to dispose of fishing gear stored at the Nimitz Marine Facility of the Scripps Institution of Oceanography. Salapare returned to Tiburon the next day. Kato continued on to San Pedro, Port Hueneme, Santa Barbara, Arroyo Grande Monterey, and South San Francisco, conferring with fishermen, processors, or fish brokers at each stop.

4 - Bill Lenarz presented an overview of the rockfish fisheries at a California Sea Grant workshop in Davis.

7 - Bill Lenarz met with staff of the Pacific Fishery Management Council in Eureka to discuss the groundfish amendment package.

- Joseph Hightower presented a seminar at Humboldt State University in Eureka, California.

7- 8 - Susan Smith attended the Recreational Fisheries Task Force meeting at the Southwest Fisheries Center in La Jolla.

7- 9 - Norman Abramson attended meetings of the Pacific Fishery Management Council and the Scientific and Statistical Committee in Eureka, California.

9 - William Lenarz represented the Groundfish Management Team at a Pacific Fishery Management Council meeting in Eureka, California. Joseph Hightower attended the meeting as an observer.

16-18 - Tina Wyllie Echeverria traveled to the National Weather Service in Redwood City, California, and to the Pacific Fisheries Environmental Group in Monterey, California.

29 - Jeannette Whipple attended a meeting of the Striped Bass Task Force in Stockton. The meeting, conducted by Don Stevens of the California Department of Fish and Game, was to discuss hypotheses relating to the decline of striped bass in the San Francisco Bay-Delta and to assign priorities and responsibilities for addressing the hypotheses in an upcoming report. While in Stockton, Whipple also observed the histopathological autopsy of striped bass by Dianne Knudsen and other CDF&G staff as part of the annual monitoring program for health and condition of striped bass. Parasite identifications and pathological conditions were verified at that time.

PERSONNEL ACTIONS

Honolulu Laboratory

March 1 - Susan L. Austin, Biological Technician (Wildlife) - Termination.

2 - Christofer H. Boggs, Fishery Biologist (Research) - Promotion.

- Joseph W. Schulz, Library Aid - Conversion to Appointment.

3 - Paul L. Jokiel, Supervisory Fishery Biologist (Research) - Extension of Temporary Appointment.

4 - Robert J. Morrow, Biological Technician (Wildlife) - Extension of Temporary Appointment.

5 - Gaylene M. Yoneda, Data Transcriber - Extension of Temporary Appointment.

10 - Jimmy R. Baxter, Computer Programmer - Termination of Appointment.

12 - Doris J. Alcorn, Wildlife Biologist - Extension of Temporary Appointment.

16 - Robert J. Morrow, Biological Technician (Wildlife) - Conversion to Appointment.

17 - Carol M. Fujisawa, Biological Aid - Extension of Temporary Appointment.

- Thea C. Johanos-Kam, Wildlife Biologist - Extension of Temporary Appointment.

- Bruce C. Mundy, Fishery Biologist - Extension of Temporary Appointment.

23 - Fred Frizelle, Computer Clerk - Extension of Temporary Appointment.

25 - Theresa Villanueva, Biological Science Student Trainee - Return to Duty.

29 - Gaylene M. Yoneda, Data Transcriber - Termination - Transfer to Department of the Army.

30 - Michael P. Seki, Biological Technician (Fisheries) - Reassignment.

- John T. Harrison, Fishery Biologist (Research) - Termination of Appointment.

April 7 - Linda D. Banish, Veterinary Medical Officer - Extension of Temporary Appointment.

12 - Gary L. Kamer, Statistician - Termination - Transfer to Department of Health and Human Services.

13 - Raymond P. Clarke, Biological Technician (Fisheries) - Career-Conditional Appointment.

15 - Lance S. Asagi, Biological Aid - Extension of Temporary Appointment.

17 - Raymond P. Clarke, Biological Technician (Fisheries) - Conversion to Appointment.

La Jolla Laboratory

March 3 - Gretchen Tripp, Biological Aid - Entered on Duty.

4 - Carolyn Macky, Statistician, Extension of Appointment.

30 - Peter LaCivita, Biological Technician - Entered on Duty.

31 - Michael Davis, Biological Aid - Entered on Duty.

- Aaron Weinfield, Computer Clerk - Extension of Appointment.

April 4 - Sharon Hamer, Biological Technician - Resignation.

9 - Joseph Joy, Computer Programmer - Extension of Appointment.

9 - Joseph Joy, Computer Programmer - Extension of Appointment.

23 - Kevin Coldwell, Computer Clerk - Entered on Duty.

25 - Todd Clopine, Computer Assistant - Resignation.

Pacific Fisheries Environmental Group

March 16 - Tom Pham, Oceanographer - Converted to Permanent Appointment.

Tiburon Laboratory

March 30 - Sharon L. Moreland, Biological Technician (Fisheries) - Promotion.

31 - Jacqueline Toa Hing Chan, Biological Aid - Temporary Appointment.

April 4 - Howard A. Jemison, Lt. NOAA Corps - Transfer to NMFS Northeast Fisheries Center, Woods Hole, Massachusetts.

TRAINING

Honolulu Laboratory

April 9 - In the place of Richard Shomura, who was out of town, George Boehlert attended a management course in employment practices.

Tiburon Laboratory

March 24-25 - Carol Reilly, Fishery Biologist - Standard First Aid, Red Cross.

STATUS OF PUBLICATIONS

PUBLISHED

Bakun, Andy. 1986. Definition of environmental variability affecting biological processes in large marine ecosystems. In: K. Sherman and L. Alexander (eds.), Variability and Management of Large Marine Ecosystems (LME's). Asso. Adv. Sci.

Gilmartin, W.G., R.J. Morrow and A.M. Houtman. 1986. Hawaiian monk seal observations and captive maintenance project at Kure Atoll, 1981. NOAA-TM-NMFS-SWFC-59, 9 p.

The mean beach count of Hawaiian monk seals at Kure Atoll 1 April-13 September 1981 was 20.8, excluding pups of the year. Six female and four male pups were born between mid-February and late August. Six of the pups were born on Green Island, four on Sand Island. A single female pup disappeared before weaning and a male pup disappeared about 1 month after weaning. The other eight pups were double flipper-tagged after weaning.

Five female pups were captured after weaning and maintained for a limited time in a large beach enclosure. These seals were fed live locally caught reef fishes and invertebrates. The pups were released on 2 September and one disappeared within a few days. The four other female seals have been resighted at Kure Atoll each field season through 1985.

Herrick, Jr., Samuel F. and Kevin L. Carlson. 1986. A budget simulation model for west coast albacore trollers. NOAA-TM-NMFS-SWFC-57, 41 p.

Johanos, T.C. and A.K.H. Kam. 1986. The Hawaiian monk seal on Lisianski Island: 1983. NOAA-TM-NMFS-SWFC-58, 37 p.

A study of the endangered Hawaiian monk seal, Monachus schauinslandi, was conducted on Lisianski Island, in the Northwestern Hawaiian Islands, from 25 April to 9 August 1983. The entire monk seal population on Lisianski Island had been identified during 1982 by scars, natural markings, and applied bleach marks; this identification was carried through the 1983 field season. A census was conducted every other day, and the entire island was monitored daily for noteworthy events. Monk seal scats and spews were collected, and all net and fishing gear flotsam that washed ashore were sampled and then destroyed.

Excluding pups, beach counts on census ranged from 66 to 108 seals (average of 86). There were 258 individual seals identified on Lisianski during 1983. Twenty-five pups were born; 24 survived to weaning and all weaned pups were observed within 11 days before camp termination. In addition to the pup, another seal died during and one seal died just before the beginning of the field season.

During a 1-year period (August 1982 to August 1983), 9 seals immigrated to Lisianski, 3 seals emigrated from Lisianski, and 14 seals either disappeared or died.

Jones, D.R., R.W. Brill and D.C. Mense. 1986. The influence of blood gas properties on gas tensions and pH of ventral and dorsal aortic blood in free-swimming tuna, Euthynnus affinis. J. exp. Biol. 120:201-213.

Kato, Susumu, and Stephen C. Schroeter. 1985. Biology of the red sea urchin, Strongylocentrotus franciscanus, and its fishery in California. Mar. Fish. Rev. 47(3):1-20.

The California fishery for the red sea urchin, Strongylocentrotus franciscanus, has grown steadily since its inception in 1972, and the maximum annual catch has exceeded 11,000 metric tons. Most of the product of the fishery, the roe, is exported to Japan, though a significant amount is also consumed in the United States. This paper describes aspects of red sea urchin life history, distribution, abundance, ecology, and management. A detailed description of the fishery, including harvesting, processing, shipping, and marketing methods, is also given.

Kirschvink, Joseph L., Andrew E. Dizon and James A. Westphal. 1986. Evidence from strandings for geomagnetic sensitivity in cetaceans. J. exp. Biol. 120:1-24.

The authors tested the hypothesis that cetaceans use weak anomalies in the geomagnetic field as cues for orientation, navigation and/or piloting. Using the positions of 212 stranding events of live animals in the Smithsonian compilation which fall within the boundaries of the USGS East-Coast Aeromagnetic Survey, it was found that there are highly significant tendencies for cetaceans to beach themselves near coastal locations with local magnetic minima. Monte-Carlo simulations confirm the significance of these effects. These results suggest that cetaceans have a magnetic sensory system comparable to that of other migratory and homing animals, and predict that the magnetic topography and in particular the marine magnetic lineations may play an important role in guiding long-distance migration. The 'map' sense of migratory animals may therefore be largely based on a simple strategy of following paths of local magnetic minima and avoiding magnetic gradients.

Lynn, Ronald J. 1986. The subarctic and northern subtropical fronts in the eastern North Pacific Ocean in spring. J. Phys. Oceanogr. 16(2):209-222.

The subarctic and subtropical frontal zones of the eastern North Pacific Ocean were surveyed in June for five consecutive years starting in 1972. These surveys form the basis for a description of the complex frontal distributions and their year-to-year differences. The fronts appear as surface outcroppings of haloclines: the subarctic halocline where salinity increases with depth and the subtropical halocline where the opposite prevails. Between the fronts lies a transition zone where strong vertical gradients of salinity are

generally absent. An examination of the northern boundary of subtropical waters in this new dataset reveals the presence of two major fronts in the subtropical frontal zone. In addition to the front commonly identified as the subtropical front (18°C and 34.8°/••) is a northern subtropical front that forms the northern boundary of the subtropical halocline in the eastern North Pacific. It falls some 2° to 3° of latitude north of the subtropical front and is the same front observed by Roden which he termed the "34°N front". There is evidence that this front is quasi-continuous over great distances like the other major fronts of the temperate zone. Its temperature-salinity characteristics, 14° to 17°C and 34.4 to 34.6°/••, are also those of Kuroshio front in the Kuroshio Extension. Narrow cores of extra-high salinity that indicate current jets occur at the high-salinity side of the northern subtropical front and, sometimes, the subarctic front. Geostrophic flow is often locally intensified about the fronts. The many salinity features are closely associated with the velocity patterns, indicating the complexity of advection and suggesting, at times, a banded structure in the current field. In June 1972, 1973 and 1976 the frontal gradients were strongly developed; in June 1947 they were diffused and broken. These findings agree with Saur's time-series study of surface salinity gradients along a track crossing the same area and concurrent in time.

Polovina, J.J. 1985. Variation of catch rates and species composition in handline catches of deepwater snappers and groupers in the Mariana Archipelago. Proceedings of the Fifth International Coral Reef Congress, Tahiti, 5:515-520.

A total of 7621 deepwater snappers and groupers were caught with handline gear in a systematic survey of 22 banks in the Mariana Archipelago with six cruises spanning mid-1982 through mid-1984. Variations in the catch-per-unit effort (CPUE) and catch composition at banks due to geographic and temporal factors is examined.

Both bank type and latitude explain variation in CPUE. Seamounts have higher CPUE values than the high islands at the same latitude while within bank types, CPUE increases with increasing latitude. For both bank CPUE and bank catch composition, variation between banks within a cruise period is substantially greater than variation between banks over the 2-year survey period. A relationship between the index of the diversity of the bank catch composition and an index of the area of bottom fish habitat at the bank is established. Cluster analysis applied to the bank catch composition indicates that all the banks can be grouped into one of three catch profiles which are relatively invariant over the survey period. Bank size appears to explain the catch composition and bank grouping for at least two of the three clusters.

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Young jack mackerel, Trachurus symmetricus, living offshore are starving while those living nearshore are healthy. These results for sea-caught jack mackerel were determined by using histological and morphological criteria that reliably diagnosed the viability of laboratory-raised jack mackerel. Both the histological and morphological indices indicated that 350 km offshore about 70% of the first-feeding jack mackerel were starving. In contrast, 12% of the fish collected near islands and banks were starving. In both habitats, mortality rates decreased to zero for jack mackerel at 2 weeks of age. The accuracy of the techniques for prediction of the nutritional state of wild larvae is discussed and evaluated.

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Sexual dimorphisms, and factors influencing the evolution of these differences, have been investigated for four species of rockfish: Sebastes melanops, S. flavidus, S. mystinus, and S. serranoides. These four species, which have similar ecology, tend to aggregate by species with males and females staying together throughout the year. In all four species adult females reach larger sizes than males, which probably relates to their role in reproduction. The number of eggs produced increases with size, so that natural selection has favored larger females. It appears males were subjected to different selective pressures than females. It was more advantageous for males to mature quickly, to become reproductive, than to expend energy on growth. Other sexually dimorphic features include larger eyes in males of all four species and longer pectoral fin rays in males of the three piscivorous species: S. melanops, S. flavidus, and S. serranoides. The larger pectoral fins may permit smaller males to coexist with females by increasing acceleration and, together with the proportionately larger eye, enable the male to compete successfully with the females to capture elusive prey (the latter not necessarily useful for the planktivore S. mystinus). Since the size of the eye is equivalent in both sexes of the same age, visual perception should be comparable for both sexes.

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